

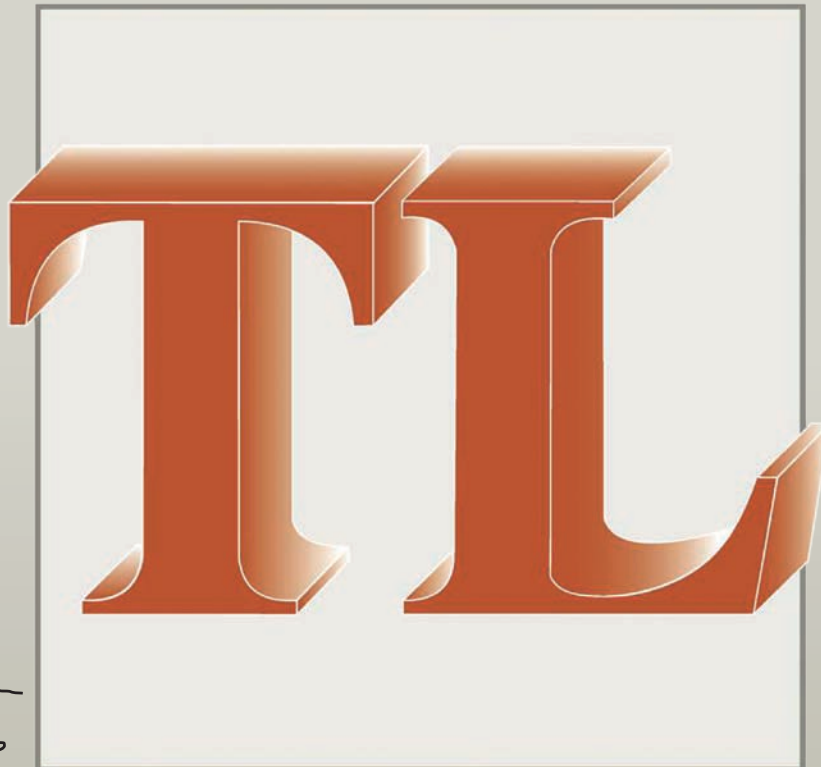
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onstrate that the TPM from these THPs, are considerably less mutagenic, genotoxic and cytotoxic than cigarette smoke and suggests THPs are potentially reduced risk products relative to cigarettes.

P22-05

***In vitro* toxicity assessment of paints with antimicrobial properties – a comparative study**

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In this work, the *in vitro* cytotoxicity of self-disinfecting wall paints containing antimicrobial substances was assessed, using skin and lung cell lines.

Self-disinfecting surfaces have appeared as an alternative to common cleaning and disinfection protocols applied in different scenarios. These surfaces are even more trend nowadays due to the Covid-19 pandemic. We developed a wall paint formula with antimicrobial properties to be applied in areas with high propensity for infection spreading. To do so, substances with known activity against microorganisms were incorporated on a commercial wall paint. Both paints containing Bacitracin (0.6 g/L) or Colophony (3.2 g/L) showed good antimicrobial activity against several bacteria, namely *Staphylococcus aureus* and *Escherichia coli*. However, an important step of our work is to assure these surfaces' safety, both for people contacting with it and for workers handling the products.

Following ISO 10993¹, direct contact and extracts tests were performed. The surfaces were placed in direct contact with *in vitro* cell cultures of HaCaT skin cells for 24h at 37°C, 5% CO₂. In parallel, the surfaces were lixiviated in culture media and their extracts at several concentrations were exposed to HaCaT cells and A549 human alveolar epithelial cells, for 24h at 37°C, 5% CO₂. Then, neutral red uptake (NRU), cell proliferation reagent WST-1 and lactate dehydrogenase activity (LDH) assays were performed, both on direct contact and extracts tests, for quantitative evaluation of cytotoxicity.

For direct contact tests on HaCaT cells, both surfaces containing Bacitracin or Colophony showed cell viabilities of around 90%, with NRU and WST-1 showing similar results. LDH release was around 25% for both surfaces.

Regarding the tests with the extracts on HaCaT cells, cell viability fluctuated between 85–70% for Bacitracin and between 80–90% for Colophony, according to the extract concentration. A proportional response was detected when decreasing the concentration of extract. LDH release was around 5–15% for Bacitracin and around 5–20% for Colophony. On A549 cells, the test on extracts demonstrated a cell viability of 100% for both surfaces and a LDH release of 15–25% for Bacitracin and 10% for Colophony.

These results suggest that the extract forms of the Bacitracin and Colophony are more toxic to HaCaT cells comparing to the direct contacting surfaces containing the same compounds, however, with lower LDH release levels.

Comet assay, measuring DNA damage is being performed to further evaluate the formulas' toxicity.

References

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P22-06

Toxicology brought to justice: Risk assessments and liability assessments related to high levels of PFAS

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In December 2013 high levels of PFAS was found in the drinking water in Ronneby, Sweden. The levels of PFAS (sum of 11) reached 10380 ng/L (for comparison the EU drinking water directive limit value is 100 ng/L). It was soon confirmed that the nearby military airport localised within the aquifer area had leached PFASs to the environment. Extensive biomonitoring in the municipality population started in June 2014 and revealed high levels in serum^[1]. Median concentrations were PFHxS, 277 ng/mL (range 12–1660); PFOS, 345 ng/mL (range 24–1500); and PFOA, 18 ng/mL (range 2.4–92).

Since then, the legal rounds have been many, before the case was finally taken up in Blekinge District Court in February 2021 in a civil court trial. The question was whether Ronneby municipality has any liability towards the victims 165 exposed residents. The municipality that are responsible for drinking water argue that the right to damages should be examined individually and that the persons should be able to show a clear connection between the intake of PFAS and their personal illness.

Regulatory tools that the protection of drinking water could be broadly divided into two approaches: limit/guidance values determining allowable exposures (preventive risk assessment), and in cases where an exposure has occurred, of the right to compensation (reactive risk assessment). The basis for both regulatory systems is toxicological and epidemiological data, but there is a lack of knowledge of how the concepts of risk and uncertainty are operationalized before and after exposure.

The verdict given in April 2021 stated that Ronneby municipality should compensate the plaintiffs for personal injury in the form of elevated levels of PFAS in the blood, which means increased health risks and physical changes and deteriorations of the body. In the verdict from the district court, the WHO definition^[3] of adverse effects is used for the first time in a Swedish court, i.e. a change “that results in an impairment of functional capacity, an impairment of the capacity to compensate for additional stress, or an increase in susceptibility to other influences.” The judgment has been appealed to the Court of Appeal.

We have reviewed the role of different types of risk assessment methodology and concepts in this court case, with a focus on toxicological and legal issues regarding risk, causality and harm. The commonly used approach of comparing the estimated exposures (in this case serum levels) to a guidance value estimated to be without appreciable health effects played a major role in the court case. An alternative to this deterministic assessment is probabilistic risk assessment^[2]. We argue that this would be particularly useful in situations like the Ronneby case, when a deterministic (point estimates) risk assessment indicates that guidance values are exceeded or when significant equity or environmental justice issues are raised by inter-individual variability.

References

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